Benefit and Cost Analysis

This section describes and quantifies the benefits and costs of each Project component.

Flood Damage Reduction Benefit-Section D1

A major goal of the Project is to provide Flood Damage Reduction (FDR) benefits.

Phase II-Eaton Wash Dam Rehabilitation Project

Eaton Wash Dam is required by DSOD to withstand a Maximum Credible Earthquake (MCE). As determined by the technical analysis completed for the dam (Appendix 3-A), the Sierra Madre fault poses the greatest seismic hazard. The MCE for the Sierra Madre fault is 7.3. The earthen embankment dam will not catastrophically fail during the MCE for the Sierra Madre fault. But the existing dam outlet tower, which houses the outlet gates, will likely fail or experience significant damage during the MCE. It is also reasonably predicted that the outlet tower will be damaged and deform to an extent that will render the outlet gates inoperable during a 6.0 magnitude earthquake on the Sierra Madre fault. The tower is expected to withstand a magnitude 5.6 event. The return rate for the MCE on the Sierra Madre fault is 520 years (probability of 0.19% occurrence).

Without functioning outlet gates, the reservoir cannot be emptied and will continue to receive storm water runoff and recession flows from the upstream watershed until the water elevation reaches the spillway and flows over. The potential dam failure and subsequent flood damage is not associated with one specific hydrologic event since all storms (large and small hydrologic events) and runoff flows will enter the reservoir. The flood damage is associated with a release of the reservoir due to embankment failure. The failure is expected to result from minor embankment damage from a large earthquake event (magnitude 6.0 or larger that renders the outlets inoperable) and the subsequent hydrostatic and seepage forces that will result from a continued high reservoir level. The predicted probability of failure for the dam is 5 and 10 percent for 6.0 and 7.5 magnitude seismic events, respectively. The dam is expected to withstand a 5.6 magnitude event. With the proposed Project, the reservoir could safely be dewatered through the new outlet works and allow for repair of any developing embankment issue.

Eaton Wash Dam failure will inundate an area of 828 acres, as was detailed in Table 7 included in Attachment 7. The inundation map and the affected parcels are included in Appendix 7-A**.** The 2003 improvement value for all of the affected parcels is $539,157,000. The content value is assumed to be 50 percent of the improvement value. The 2012 improvement and content values were determined by multiplying by an update factor (as provided by Department of Water Resources) of 1.20. The 2012 combined value is $970,483,000. The cost of the dam structure is also considered as part of the expected damage without the project.

Table 11 was used to calculate the expected annual flood damage from the Eaton Wash dam failure. Table 11 is attached is **Appendix 8-A.**

Phase V- Devil's Gate Reservoir Sediment Removal and Management

Devil's Gate Dam was designed to capture storm water, sediment and debris during storm events and to prevent high flow rates or sediment laden flows from overwhelming the downstream flood control channel. The sediment inflows that resulted from the 2009 Station Fire and subsequent storm events significantly reduce the flood protection that the dam provides. The burned condition of the watershed increases the amount of storm runoff and sediment inflow to the reservoir. Extensive hydrologic and hydraulic analyses were conducted to determine the potential flooding impacts. The Flood Hazard Warning and Contingency Plan for Arroyo Seco Channel is included in Appendix 3-A. The parcels that will be affected by the Capital (50-Year) Storm are listed in Appendix 7-A. The 2012 improvement and content values were determined in the same manner as was described for the Eaton Wash Dam parcels above. The combined value is $40,130,000.

The areas that are expected to be inundated during 25 and 100-year events were determined based on the limits of the Capital Storm inundation area and the topography of the area, as shown on the detailed contour maps provided in **Appendix 8-B.** A cost of the improvement and content values was then estimated for the area. The probability of failure for the areas was determined by evaluating critical flooding points along the channel and analyzing the unbulked and bulked flow rates (as determined using methods defined in the Los Angeles County Department of Public Works Hydrology and Sedimentation Manuals) associated with the hydrologic events.

Table 11 was used to calculate the expected annual flood damage from the Devil's Gate Dam associated with its current impact condition. Table 11 is attached is **Appendix 8-A.**

Dam failure for Devil's Gate Dam was evaluated and is listed in, but its inundation costs, as listed in **Appendix 8-A**, are **not** included in the calculation of damages. If the District did not complete the project or conduct future sediment removal, the dam could eventually fill completely with sediment and face uncontrolled overtopping which could result in structural failure, which would inundate a significant area (map and parcels included in Appendix 7-A). However, this was **not** determined to be a reasonable scenario to include in this proposals benefit and cost analysis.

Table 12 summarizes Table 11 (Expected Annual Damage) completed for both Eaton Wash Dam and Devil's Gate Dam. Table 12 is included in **Appendix 8-A**.

Non-Monetized Benefit Analysis-Section D2

The Project has numerous benefits that cannot be easily monetized. Table 13 in **Appendix 8-A** has a checklist of these benefits and further description is as follows:

- Flood Damage Protection

  Phase I- Eaton Wash Spreading Grounds Improvements, Phase III-Eaton Wash Spreading Grounds Intake Improvement and Basin Enlargement, and Phase IV- Devil's Gate Water Conservation will all divert significant amounts of water from the flood control channel. This can provide flood damage reductions downstream during intense local storm events.

- Water Quality Benefits

  All Project components will provide water quality benefits to the Raymond Groundwater Basin. The benefit associated with the amount of groundwater recharge that each project provides, but the monetized value is not easily determined. The Project will treat a total of 6,103 acre-feet per year when all Project components are completed.

- Enhanced Ecosystem

  All Project components will contribute to a significant increase in the amount of local water supply, which in turn, will decrease the demand for water exports from the Bay-Delta. Since the Bay-Delta ecosystem is sensitive to water levels, decreased exports are expected to increase the Bay-Delta's habitat quality and potentially increase recreational opportunities.

  The decrease in demand for water imports into the region will result in less environmental impacts associated with generation and use of the required power to transport water from the Bay-Delta and the Colorado River to Los Angeles County.

- Avoided Costs

  Costs were not quantified for lost business net income, lost rental income, loss of wages, and loss of utility services for the areas that the Project will protect from flood damage. Two major freeways that convey very high volumes of traffic face potential damage. The costs for loss of use of the freeways were not calculated. These costs are

predicted to be very significant because of the population density of the area and the high volume of traffic on the freeways.

- Social Benefits

  Phase III will provide additional landscaping amenities and a decomposed granite walking path in the public right-of-way. The social benefit that will result from the project was not monetized.

- Historical Landmark Flood Protection

  The Project will protect the Arroyo Parkway, 110 freeway. The freeway has significant historical and scenic value. This benefit was not monetized.

- Disadvantage Community Flood Protection
  The flood protection that the Project will provide along the Arroyo Seco, will protect a large number of Disadvantaged Communities.

Monetized Benefits Analysis-Section D3

Project Costs
The Project costs are estimated in Table 16 in **Appendix 8-A**. The initial implementation cost is in 2012 dollars. The administrative, operational, maintenance, and replacement costs for each Project is component based on the type of improvements and average costs of similar District facilities.

Project Benefits
This Project will create local water supply due to increased storage capacity, system interties, and conjunctive water resources management. The costs savings arising from the Project's increased water supply is the cost that would otherwise be required to purchase an equivalent water supply. The least cost replacement water supply would be imported water purchased from MWD. The costs are estimated based on the projected future cost of imported water as outlined in **Appendix 8-C.** Table 14 for each Project component uses the projected costs to monetize the water supply benefit over the expected project life to determine the annual benefit.

Annual Cost of Avoided Project

This proposal assumes that the project that would be avoided is the purchase of land and property within the inundation areas along with the future maintenance of the areas. For the

Devil's Gate Dam Capital Storm inundation area, 100 percent of the 2012 value was assumed as the initial avoided cost. Subsequent maintenance on the area is estimated at $4,000 dollars per acre, which is considered very conservative based on maintenance of the Districts landscaping on spreading grounds facilities. Devil's Gate Dam Failure inundation area land and property values were calculated, but this value was not considered as an avoided cost for the Project. For the Eaton Wash Dam inundation area, only 1 percent of the 2012 value was assumed as the initial avoided cost since the probability of the combined interval and failure probability is low.